1. Find the midpoint and distance of the points $(2, 3)$ and $(-3, 5)$
   Solution:
   Midpoint: $(\frac{2+(-3)}{2}, \frac{3+5}{2}) = (-\frac{1}{2}, 4)$
   Distance: $\sqrt{(-3-2)^2 + (5-3)^2} = \sqrt{5^2 + 2^2} = \sqrt{29}$

2. Find a point on the y-axis that is equidistant from the points $(2, 0)$ and $(3, -5)$
   Solution:
   Since the point is on the y-axis it has the form $(0, y)$.
   The distance from the first point is $\sqrt{(2-0)^2 + (0-y)^2} = \sqrt{4 + y^2}$
   The distance from the second point is $\sqrt{(3-0)^2 + (-5-y)^2} = \sqrt{9 + 25 + 10y + y^2} = \sqrt{34 + 10y + y^2}$
   Since it is equidistant from both points, we get $4 + y^2 = 34 + 10y + y^2$
   We solve this equation:
   $4 = 34 + 10y$
   $10y = -30$
   $y = -3$
   Hence the point is $(0, -3)$.

3. Find the x- and y-intercepts and test for symmetry: $y = 16 - x^4$
   Solution:
   x-intercepts: set $y = 0$: $0 = 16 - x^4 \rightarrow x^4 = 16 \rightarrow x = \pm 2$
   y-intercepts: set $x = 0$: $y = 16 - 0^4 = 16$
   Symmetry:
   x-axis: $-y = 16 - x^4$ not the same, so no symmetry
   y-axis: $y = 16 - (-x)^4 = 16 - x^4$ same, so there is symmetry
   origin: $-y = 16 - (-x)^4 = 16 - x^4$ not the same, so no symmetry

4. Find the center and radius of the circle $x^2 + y^2 - 2x + y + 1 = 0$
   Solution:
   Complete the square:
   $x^2 - 2x + 1 + y^2 + y + \frac{1}{4} = -1 + 1 + \frac{1}{4}$
   $(x-1)^2 + (y + \frac{1}{2})^2 = \frac{1}{4}$
   Hence the center is $(1, -\frac{1}{2})$ and the radius is $\sqrt{\frac{1}{4}} = \frac{1}{2}$

5. Find the slope-intercept form of the line through the point $(3, -2)$ perpendicular to the line through $(1, 4)$ and $(-2, 3)$
   Solution:
   First find the slope of the line: $m = \frac{3-4}{-2-1} = \frac{-1}{-3} = \frac{1}{3}$
   Since we are looking for the perpendicular line, the slope is $m = -\frac{1}{\frac{1}{3}} = -3$
   Now use the point-slope form to set up an equation of the line:
   $y - (-2) = -3(x - 3)$
   Bring it into slope-intercept form: $y = -3x + 9 - 2 = -3x + 7$

6. Find the domains of the following functions:

(a) $f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ x - 2 & \text{if } 0 < x \leq 2 \end{cases}$

Solution:

The function is only defined for $x < 0$ and $0 < x \leq 2$, hence the domain is $(-\infty, 0) \cup (0, 2]$

(b) $g(x) = \sqrt{x^2 - 4x}$

Solution:

The term under the root cannot be negative, so $x^2 - 4x \geq 0$

Solve this inequality:

$x(x - 4) \geq 0$

Hence the critical points are 0 and 4.

Check the intervals:

between $-\infty$ and 0: test -1: positive $\longrightarrow$ part of the domain

between 0 and 4: test 2: negative $\longrightarrow$ not part of the domain

between 4 and ∞: test 5: positive $\longrightarrow$ part of the domain

Hence the domain is $(-\infty, 0] \cup [4, \infty)$